Remarks

35 USC § 103 (a)

The examiner has rejected claims 1, 3, 8-15, and 17 as being unpatentable under 35 USC § 103(a) over Haltiner el al. (US 2003/0235746A1) in view of Pondo (US 6,017,649) and further in view of Thomas et at. (US 2005/0074659).

With respect to claims 1, 8 and 13, and all remaining claims by virtue of dependency, the examiner admits that Haltiner fails to teach the stamped separator plate and frame with displaced outer edges. The examiner then relies, exclusively, on Pondo for that teaching. As such, the examiner is arguing that the combination of Pondo and Haltiner renders claims 1 and 13 obvious because while Haltiner does not teach the stamped separator plate and frame with displaced outer edges, Pondo allegedly teaches this limitation.

However, as pointed out in the applicant's November 9, 2009 correspondence, it is impermissible to combine Pondo with Haltiner to provide this teaching, because Haltiner teaches away from this exact limitation. As will be discussed below, the applicant disagrees that Pondo teaches the limitation (the stamped separator plate and frame with displaced outer edges), but this doesn't matter. The point is that even if Pondo did teach the stamped separator plate and frame with displaced outer edges, Pondo STILL could not be properly combined with Haltiner, because Haltiner teaches away from this exact missing feature (the stamped separator plate and frame with displaced outer edges.) Thus, Haltiner cannot be properly combined with any reference that shows this limitation, because by teaching away from the limitation, Haltiner also teaches away from any such combination. The examiner's reliance on the combination of Pondo to

supply this feature to the Haltiner disclosure is therefore impermissible as a matter of law. As such, the applicant will appeal any final rejection of these claims on this basis.

It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983) (The claimed catalyst which contained both iron and an alkali metal was not suggested by the combination of a reference which taught the interchangeability of antimony and alkali metal with the same beneficial result, combined with a reference expressly excluding antimony from, and adding iron to, a catalyst.). MPEP 2145 (X)(D)(2).

As previously noted, Haltiner el al. (US 2003/0235746A1) shows a series of flat plates which, when laid on top of one and another, form the various pathways for the gasses to travel. See figures 1,2,3,4,5,6,7,8,9, and 10. As the examiner concedes, Haltiner does not teach that the stamped separator plate has an outer edge and at least one oxygen manifold collar displaced in an upward direction and the stamped frame has an outer edge and at least one hydrogen manifold collar displaced in a downward direction. Quite the contrary, Haltiner in fact teaches that it is advantage of the Haltiner system that all the parts are flat. In the abstract, Haltiner makes this plain where he states:

> A fuel cell module having four sheet metal parts stamped from flat stock. The parts do not require any forming operations such as folding or dishing. Each part may have a different thickness to suit its function. The first part is a cell mounting frame for receiving and supporting a PEN fuel cell element. The second part is a cathode spacer, the thickness of the spacer determining the height of the cathode air flow field. The third part is an anode spacer, the thickness of spacer determining the height of the anode fuel flow field. The fourth part is a separator plate for separating the anode gas flow in one cell from the cathode air flow in an adjacent cell in a fuel cell stack. The four plates are joined by welding or brazing and may be assembled in any order or combination which suits the assembly process. Any desired number of modules may be stacked together to form a fuel cell stack.

Accordingly, Haltiner teaches that it is an ADVANTAGE of Haltiner's invention that the various parts do "not require any forming operations such as folding or dishing." Haltiner thus teaches directly away from the claimed feature of the stamped separator plate having an edge displaced in an upward direction, and a stamped frame having an edge displaced in a downward direction. Haltiner teaches that such displacements are to be avoided. For that reason, the combination of Haltiner with any reference that teaches such displacement, which the examiner claims is found in Pondo, is impermissible.

The applicant notes that the applicant made this argument in the applicant's November 9, 2009 correspondence. However, in the office action dated May 13, 2010 the examiner ignored this argument completely, and failed to provide any response. Instead, the examiner mischaracterized and misstated the applicant's observations about the Pondo reference.

Specifically, in the office action dated May 13, 2010 the examiner claims that the applicant argued that "Pondo fails to teach PEN cells." The examiner then argued that Pondo does teach PEN cells. However, the examiner built a straw-man that didn't exist. The applicant didn't argue that Pondo failed to tech PEN cells. The applicant merely noted that Pondo called them "carbonate layers." The point, however, was that Pondo uses the carbonate layers (or PEN cells, if the examiner prefers) to form the gas manifolds. This point is essentially indisputable. At column 6, lines 58-64, Pondo recites that:

> When the cell components are stacked, the aligned perforations in separator plate 10, first matrix layer 14, first carbonate layer 15, second matrix layer 16, second carbonate layer 17, and third matrix layer 18 form internal gas manifolds for transport of reactant gases to and from the anode and cathode facing faces of separator plate 10.

In contradistinction, the applicant shows and claims at claim 1 that the manifolds are formed by attaching the frame to the separator plate. While the PEN cells are undoubtedly involved in the fuel cell stack, it is the frame and the separator plate that form the manifold. The examiner argues that Figure 1 shows "the manifolds (13) are formed in the separator plate (10)." However, this characterization of Figure 1 directly contradicts the written description in Pondo. Contrary to what the examiner states, Pondo does not teach that "the manifolds are formed in the separator plate." Rather, as shown above, Pondo teaches that the manifolds are formed by "the aligned perforations in the separator plate" with the other components, specifically the first matrix layer 14, the first carbonate layer 15, the second matrix layer 16, the second carbonate layer 17, and the third matrix layer 18. In other words, Pondo uses the aligned perforations in ALL of these parts to form the manifold.

That was the point the applicant was making in the applicant's November 9, 2009 correspondence. Whereas Pondo uses the aligned perforations in the carbonate layers (or PEN cells, if the examiner prefers) to form the gas manifolds, the present invention DOES NOT. Instead, as the examiner correctly notes, the present invention forms the manifolds by attaching the separator plate to the frame, and there are no perforations in the PEN cell.

Notably, Pondo doesn't even use a frame. The applicant assumes that the examiner must be interpreting one of the successive separator plates shown in Pondo as a filling the same role as the "frame" of the present invention. Otherwise, Pondo fails to even show one of the key parts that the examiner concedes is not shown in Haltiner. Obviously, the fact that Pondo is missing the frame also means that the combination of

Pondo and Haltiner cannot teach the limitation that the edge of the frame is displaced in a downward direction. Since the examiner concedes this teaching is missing from Haltiner, the fact that the frame is also missing from Pondo means that no prima facie case of obviousness can be made by the combination.

However, giving the examiner the benefit of the assumption that one of the successive separator plates shown in Pondo is a filling the same role as the "frame" of the present invention, even if every other separator plate is called a "frame," and even if Pondo did show the displacement of the outer edges of the separator plate and the frame, Pondo still does not show the manifold being formed by attaching the frame to the separator plate at the outer edge. Pondo only shows the formation of the manifolds by the alignment of the perforations of the separator plate with the perforations of the other components, (the first matrix layer 14, the first carbonate layer 15, the second matrix layer 16, the second carbonate layer 17, and the third matrix layer 18).

But Pondo does not show the displacement of the outer edges of the separator plate and the frame. The examiner is mischaracterizing figures 2A and 2B of Pondo. The examiner states that it is "clearly seen" in figures 2A and 2B the displacement on the outer edge of the separator plate. However, it is also clearly seen that the outer edges of the two separator plates 10 are parallel to one and another, and are not welded together at the outer edge. Instead, as is clearly seen in Figures 2A and 2B, the only "hermetic seal" between the two successive separator plates 10 is inside of the outer edge, and is the seal formed by the first matrix layer 14, the first carbonate layer 15, the second matrix layer 16, the second carbonate layer 17, and the third matrix layer 18. In the now pending claim 1, the separator plate is attached directly to the frame, and they are attached at the

outer edge. Specifically, as set forth in the claim, the frame and the separator plate are attached to "form a manifold and a hermetic seal between the outer edge of the separator plate and the frame." In contradistinction, it is "clearly seen" in figures 2A and 2B of Pondo that the "outer edge of the separator plate and the frame" are not directly attached to anything. Instead, at a location somewhat inside of the outer edge, successive separator plates are attached to either side of the first matrix layer 14, the first carbonate layer 15, the second matrix layer 16, the second carbonate layer 17, and the third matrix layer 18, (or the PEN cell if the examiner prefers). Thus, giving the examiner the benefit of every assumption, that every other separator plate is called a "frame," ignoring the interposition of the PEN cell between the separator plate and the frame, and ignoring the fact that the manifold is formed by aligning the perforations in the separator plates and the PEN cell, Pondo still does not show the formation of "a hermetic seal between the outer edge of the separator plate and the frame" as is required in pending claim 1, because the connection is not made at the outer edge. As is clearly shown in figures 2A and 2B of Pondo, the "outer edge of the separator plate and the frame" are not directly attached to anything.

Thus, even if Pondo could be properly combined with Haltiner, Pondo does not provide the requisite teaching lacking in Haltiner to render the invention obvious. Pondo lacks a frame, the outer edge of the separator plate is not attached to anything, and even if one calls one of Pondo's separator plates a "frame," the separator plate itself is not directly attached to the frame; it is only attached to the PEN cell.

Nor does Thomas et al. (US 2005/0074659) provide any such teaching. Thomas relies on a housing to contain the gasses, and thus fails to disclose the features that the

stamped separator plate has an outer edge displaced in an upward direction and the stamped frame has an outer edge displaced in a downward direction. As with Haltiner, Thomas et al describe this distinction as an advantage. At paragraph 11, Thomas states:

> [0011] Provision of fuel inlet and exhaust manifolds internally of the plates and oxygen-containing gas (usually air) inlet and exhaust manifolds externally of the plates can optimize the structure of the plates from both economic and power producing perspectives. *If the manifolds were fully internalized, the construction of the plates would be more complex and a significant portion of the plates would need to be dedicated to the formation of the respective manifolds, i.e. each plate would have an increased aperture area compared to the plates in the stack of the invention.* Relatively increasing the functional area of the plates allows for maximized generation of electric current from the stack. Externalizing the air manifolds simplifies the inter-plate sealing since there are no air apertures through the plates around which individual seals must be provided, and providing the air manifolds between the plates and the housing can allow for simple seals between the air manifolds. However, internalizing the fuel manifolds also means the overall structure may be robust since external connections that may otherwise be subject to fatigue or leakage are minimized. (italics added.)

As with Haltiner, Thomas thus teaches directly away from the claimed features of the stamped separator plate having an outer edge and at least one oxygen manifold collar displaced in an upward direction and the stamped frame has an outer edge and at least one hydrogen manifold collar displaced in an downward direction, describing arrangements whereby the manifolds are internal as disadvantageous. It is important to note that Thomas teaches that internal manifolds and internalized air flow are disadvantageous generally, without considering the arrangement and claimed features of the present invention. Accordingly, it is apparent by Thomas' general deprecation of the possibility that such an arrangement would prove advantageous that Thomas did not contemplate the specific arrangement shown and claimed in the present invention, nor did Thomas realize that such an arrangement overcomes the disadvantages that Thomas

identified. In any event, even if Pondo or some other reference did teach the stamped separator plate and frame with displaced outer edges, that reference STILL could not be properly combined with Thomas, because just as is the case with Haltiner, Thomas teaches away from this exact missing feature (the stamped separator plate and frame with displaced outer edges.) Thus, Thomas cannot be properly combined with any reference that shows this limitation, because by teaching away from the limitation, Thomas also teaches away from any such combination. The examiner's reliance on the combination of Pondo to supply this feature to either the Haltiner disclosure or the Thomas disclosure is therefore impermissible as a matter of law.

It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983) (The claimed catalyst which contained both iron and an alkali metal was not suggested by the combination of a reference which taught the interchangeability of antimony and alkali metal with the same beneficial result, combined with a reference expressly excluding antimony from, and adding iron to, a catalyst.). MPEP 2145 (X)(D)(2).

Neither Haltiner el al. (US 2003/0235746A1) nor Thomas et at. (US 2005/0074659) show the stamped separator plate and frame with displaced outer edges. Pondo (US 6,017,649) does not provide this teaching, but even if it did, Pondo cannot properly be combined with these references, because both of them teach away from this feature.

Accordingly, the combination of Haltiner el al. (US 2003/0235746A1), Thomas et at. (US 2005/0074659) and Pondo (US 6,017,649) never show the feature of a stamped separator plate having at least one oxygen manifold collar displaced in an upward

direction and the stamped frame having at least one hydrogen manifold collar displaced in a downward direction. The failure of the prior art to show or suggest these limitations, combined with the fact that Haltiner el al. (US 2003/0235746A1), Thomas et at. (US 2005/0074659) actually teach directly away from these limitations, insures that the claims are readily distinguished from these references, and these references fail to set forth a prima facie case of obviousness.

The examiner then rejects claims 2 and 16 as being unpatentable over Haltiner el al. (US 2003/0235746A1), Thomas et at. (US 2005/0074659) in view of Pondo (US 6,017,649) as discussed above, and further in view of Carolan et al (US Pat. No. 5,750,279).

However, Carolan et al (US Pat. No. 5,750,279) does not remotely provide any teaching that would remedy the deficiencies of Haltiner el al. (US 2003/0235746A1), Thomas et at. (US 2005/0074659) and Pondo (US 6,017,649). Carolan et al (US Pat. No. 5,750,279) does not teach stamping either the separator plate or the frame at all. Instead, Carolan shows a complex arrangement of machined parts (See figs 11, 12 and 13) including separate tubular cells 84, end caps 82, and hollow conduit 86, all of which are missing from the present invention, and readily distinguished from the claimed features of a stamped separator plate having an outer edge and at least one oxygen manifold collar displaced in an upward direction and the stamped frame has an outer edge and at least one hydrogen manifold collar displaced in an downward direction. Accordingly, Carolan does not remotely teach these limitations of the claims as presented.

The examiner then rejects claims 4-7 and 18-21 as being unpatentable over Haltiner el al. (US 2003/0235746A1) in view of Thomas et at. (US 2005/0074659) in view of Pondo (US 6,017,649) as discussed above, and further in view of James et al. (US Pat. No. 5,766,789 A).

However, James et al. (US Pat. No. 5,766,789 A) does not remotely teach stamping, as James fails to describe the housing altogether. Accordingly, James does not discuss either the separator plate or the frame at all, much less the method of forming the manifold collar. Instead, James simply describes fuel cells as having "passageways" for fuel and oxidant generally, without showing any arrangement or assembly to provide these passageways. At column 4, lines 5-24 James states:

> A fuel cell is an apparatus for continually producing electric current by electrochemical reaction of a fuel with an oxidizing agent. More specifically, a fuel cell is a galvanic energy conversion device that chemically converts a fuel such as hydrogen or a hydrocarbon and an oxidant that catalytically react at electrodes to produce a DC electrical output. In one type of fuel cell, the cathode material defines passageways for the oxidant and the anode material defines passageways for fuel. An electrolyte separates the cathode material from the anode material. The fuel and oxidant, typically as gases, are continuously passed through the cell passageways for reaction. The essential difference between a fuel cell and a battery is that there is a continuous supply of fuel and oxidant from outside the fuel cell. Fuel cells produce voltage outputs that are less than ideal and decrease with increasing load (current density). Such decreased output is in part due to the ohmic losses within the fuel cell, including electronic impedances through the electrodes, contacts and current collectors. A need therefore exists for fuel cells that have reduced ohmic losses. The graphite current collectors used in phosphoric acid and solid polymer electrolyte fuel cells, to the cathode metal oxides such as, praseodymium oxide, indium oxide used in solid oxide fuel cells and to the nickel oxide cathode used in molten carbonate fuel cells are examples of a need for conductive additives. See generally, "Handbook of Batteries and Fuel Cells", Edited by Linden

Accordingly, James is missing all of the limitations set forth in the present invention, and is readily distinguished from the claimed features of a stamped separator

plate having an outer edge and at least one oxygen manifold collar displaced in an upward direction and the stamped frame has an outer edge and at least one hydrogen manifold collar displaced in an downward direction. Accordingly, James does not remotely teach these limitations of the claims as presented.

Conclusion

Applicant has made an earnest attempt to place the above referenced application in condition for allowance and action toward that end is respectfully requested. Should the Examiner have any further observations or comments, she is invited to contact the undersigned for resolution.

Respectfully submitted,

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